

## CLAIMS

*Sub B1*  
5 1. A production method of a branched polymer which comprises polymerizing a macromonomer [I], said macromonomer [I] being a vinyl polymer obtainable by radical polymerization and terminally having one polymerizable carbon-carbon double bond-containing group per molecule.

10 2. The production method according to Claim 1, wherein the polymerizable carbon-carbon double bond-containing group is represented by the general formula (1):  
$$-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2 \quad (1)$$
  
wherein R represents a hydrogen atom or a monovalent organic  
15 group containing 1 to 20 carbon atoms.

*1a Sol*  
20 3. The production method according to Claim 1 or 2, wherein R is a hydrogen atom or a methyl group.

*Sub B2*  
20 4. The production method according to any of Claims 1 or 3, wherein the main chain of the macromonomer (I) comprises a vinyl polymer obtainable by living radical polymerization.

*Sol*  
25 5. The production method according to Claim 4, wherein the living radical polymerization is atom transfer radical polymerization.

30 6. The production method according to Claim 5, wherein the atom transfer radical polymerization is carried out using, as a catalyst, a transition metal complex whose central metal is an element of the group 7, 8, 9, 10 or 11 of the periodic table.

35 7. The production method according to Claim 6,

wherein the metal complex to serve as a catalyst is a complex of a metal selected from the group consisting of copper, nickel, ruthenium and iron.

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8. The production method according to Claim 7, wherein the catalyst metal complex is a copper complex.

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9. The production method according to <sup>claim</sup> ~~any of Claims 1 to 3,~~ wherein the main chain of the macromonomer (I) comprises a vinyl polymer obtainable by polymerization of a vinyl monomer using a chain transfer agent.

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10. The production method according to <sup>claim</sup> ~~any of Claims 1 to 9,~~ wherein the main chain of the macromonomer (I) is a (meth)acrylic polymer.

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11. The production method according to Claim 10, wherein the polymer main chain of the macromonomer (I) is an acrylic ester polymer.

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12. The production method according to <sup>claim</sup> ~~any of Claims 1 to 9,~~ wherein the main chain of the macromonomer (I) is a styrene type polymer.

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13. The production method according to <sup>claim</sup> ~~any of Claims 1 to 12,~~ wherein the macromonomer (I) is obtainable by substituting a compound having a radical-polymerizable carbon-carbon double bond for a terminal halogen group of a vinyl polymer.

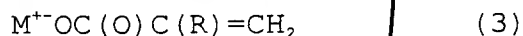
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14. The production method according to Claim 13,

wherein the macromonomer (I) is obtainable by reacting a vinyl polymer having a terminal halogen group represented by the general formula (2):



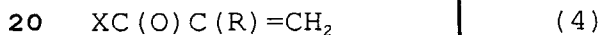
- 5 wherein  $\text{R}^1$  and  $\text{R}^2$  each represents a group attached to an ethylenically unsaturated group of a vinyl monomer and X represents a chlorine, bromine or iodine atom, with a compound represented by the general formula (3):



- 10 wherein R represents a hydrogen atom or a monovalent organic group containing 1 to 20 carbon atoms and  $\text{M}^+$  represents an alkali metal or a quaternary ammonium ion, for substitution for the terminal halogen group.

- 15 15. The production method according to <sup>claim</sup> ~~any of Claims 1 to 12,~~

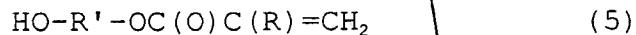
wherein the macromonomer (I) is obtainable by reacting a hydroxy-terminated vinyl polymer with a compound represented by the general formula (4):



wherein R represents a hydrogen atom or a monovalent organic group containing 1 to 20 carbon atoms and X represents a chlorine, bromine atom or a hydroxy group.

- 25 16. The production method according to <sup>claim</sup> ~~any of Claims 1 to 12,~~

wherein the macromonomer (I) is obtainable by reacting a hydroxy-terminated vinyl polymer with a diisocyanate compound and reacting the remaining isocyanato group with a compound represented by the general formula (5):



wherein R represents a hydrogen atom or a monovalent organic group containing 1 to 20 carbon atoms and  $\text{R}'$  represents a divalent organic group containing 2 to 20 carbon atoms.

1a  
SK  
C<sub>6</sub>  
1a  
17. The production method according to <sup>claim</sup>~~any of Claims 1 to 16,~~

wherein the macromonomer (I) has a number average molecular weight of not less than 3,000.

18. The production method according to <sup>claim</sup>~~any of Claims 1 to 17,~~

10 wherein the macromonomer (I) has a weight average molecular weight (Mw) -to-number average molecular weight (Mn) ratio (Mw/Mn) of less than 1.8 as determined by gel permeation chromatography.

1a  
15 19. The production method according to <sup>claim</sup>~~any of Claims 1 to 18,~~

wherein polymerization of the macromonomer (I) is conducted in the manner of radical polymerization.

20 ~~Sub B3~~ 20. The production method according to Claim 19, wherein polymerization of the macromonomer (I) is conducted in the manner of living radical polymerization.

21. The production method according to Claim 20, wherein the living radical polymerization is atom transfer radical polymerization.

25 SK  
C<sub>1</sub>  
30 22. The production method according to Claim 21, wherein the atom transfer radical polymerization is carried out using as a catalyst, a transition metal complex the central metal of which is an element of the group 7, 8, 9, 10 or 11 of the periodic table.

35 23. The production method according to Claim 22, wherein the catalyst metal complex is a complex of a metal selected from the group consisting of copper, nickel, ruthenium and iron.

24. The production method according to Claim 23,  
wherein the catalyst metal complex is a copper complex.

25. The production method according to <sup>claim</sup>~~any of Claims 1~~  
~~to 18,~~

wherein polymerization of the macromonomer (I) is  
initiated by active radiation.

26. The production method according to <sup>claim</sup>~~any of Claims 1~~  
~~to 18,~~

wherein polymerization of the macromonomer (I) is  
initiated by heating.

27. The production method according to <sup>claim</sup>~~any of Claims 1~~  
~~to 18,~~

wherein polymerization of the macromonomer (I) is  
conducted in the manner of anionic polymerization.

28. The production method according to <sup>claim</sup>~~any of Claims 1~~  
~~to 27,~~

wherein homopolymerization of the macromonomer (I) gives  
a stellar polymer.

29. The production method according to <sup>claim</sup>~~any of Claims 1~~  
~~to 27,~~

wherein copolymerization of the macromonomer (I) with a  
copolymerizable monomer (II) other than the macromonomer gives  
a graft copolymer.

30. The production method according to Claim 29,  
wherein the weight ratio between the macromonomer (I) and  
the monomer (II) is 95:5 to 5:95.

31. The production method according to <sup>claim</sup>~~any of Claims 1~~

to 27,

wherein copolymerization of the macromonomer (I) with a polyfunctional compound having two or more polymerizable carbon-carbon double bond-containing groups per molecule gives a crosslinked polymer.

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32. The production method according to Claim 31, wherein the polyfunctional compound having two or more polymerizable carbon-carbon double bond-containing groups per molecule is a polymer (III) terminally having two or more polymerizable carbon-carbon double bond-containing groups per molecule.

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33. A branched polymer obtainable by the production method according to ~~any of Claims 1 to 32.~~ <sup>Claim 1</sup>

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34. A thermoplastic elastomer comprising the polymer according to Claim 33.

35. A shock resistance improver comprising the polymer according to Claim 33.

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36. A pressure sensitive adhesive comprising the polymer according to Claim 33.